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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
RODELA, EDUARDO A	

ART UNIT	PAPER NUMBER
2826	

NOTIFICATION DATE	DELIVERY MODE
10/11/2007	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary

Application No.

10/518,963

Applicant(s)

SEITZ, PETER

Examiner

Eduardo A. Rodela

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 July 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) 11, 12 and 14 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☐ Claim(s) 1-10, 13 and 15-22 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 12/20/04 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>12/20/04 and 3/24/05</u> | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

This Office Action is in response to the Restriction Election received July 18, 2007. Claims 1-10, 13, and 15-22 are now under consideration.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 1 recites the limitation "adjacent to the second contact" in lines 7 and 8.

There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-7, 10, and 15-22 are rejected under 35 U.S.C. 102(b) as being anticipated by Schwarte (WO98/10255). It is noted that US 6,825,455 is used as a translation for WO98/10255.

Regarding Claim 1, Schwarte shows in Figures 13 and 14, an image sensor element comprising:

a semiconductor substrate [2],

a radiation transparent insulating layer [3] formed on the semiconductor substrate

[2],

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an electrode [Go] formed as a layer of transparent resistive material on the insulating layer [3],

a first contact [Gam] adjacent to one edge of the resistive layer [Go],

a first diffusion [diffusion shown under Ga contact] region in the semiconductor substrate [2] of opposite conductivity [n+] to the semiconductor substrate [2, p-type] located adjacent [next to] to the first contact [Gam] and biased to a higher potential [see state b, where Gam is at a potential slightly greater than Uo and diffusion adjacent is at a higher potential than that of Gam] than that of the first contact [Gam],

a second diffusion region [diffusion region that is under Gb contact] is the semiconductor substrate [2] of opposite conductivity [n+] to the semiconductor substrate [p-type] located adjacent to the second contact [Gbm] and biased to a higher potential [second diffusion, which is directly under contact Gb, is at a higher potential energy than that of Gbm, see state b] than that of the second contact [Gbm], means for applying an electrical potential between the first and second contacts [15], and means for reading out the charge on the first and/or second diffusion regions [15].

Regarding Claim 2, Schwarte shows the image sensor element as claim in Claim 1. In addition, Schwarte shows wherein the resistive layer is rectangular [shown to be a square shape in Figure 14].

Regarding Claim 3, Schwarte shows the image sensor element as claimed in Claim 2. In addition, Schwarte shows comprising four contacts each having a diffusion region adjacent thereto [Gam has Ga, Gbm has Gb, Gcm has Gc, and Gdm has Gd].

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Regarding Claim 4, Schwarte shows the image sensor element as claimed in Claim 3. In addition, Schwarte shows in which the contacts are arranged one at each side [this alternate embodiment is shown in Figure 8].

Regarding Claim 5, Schwarte shows the image sensor element as claimed in Claim 3. In addition, Schwarte shows in which the contacts are arranged one at each corner [Figure 14].

Regarding Claim 6, Schwarte shows the image sensor element as claimed in Claim 3. In addition, Schwarte shows in which two contacts are arranged on each of two opposite sides [Figure 14 shows Gam and Gdm on one side and Gcm and Gbm on the other side].

Regarding Claim 7, Schwarte shows the image sensor element as claimed in claim 2. In addition, Schwarte shows in which the resistive layer is square [shown to be a square shape in Figure 14].

Regarding claim 10, Schwarte shows the image sensor element as claimed in claim 1. In addition, Schwarte does show in which the photosensitive part of the element is implemented in a semiconducting layer at the surface of the substrate, the surface semiconducting layer being of opposite conductivity to the substrate, the element further comprising means for biasing the surface semiconducting layer so that it is fully depleted [column 19, lines 31-35].

Regarding claim 15, Schwarte shows a device for the detection and demodulation of a modulated wavefield comprising an image sensor consisting of a one

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or two dimensional array of image sensor elements [column 19, lines 8-12], each image sensor element being an image sensor element as claimed in claim 1:

a signal generator for supplying time dependent voltage patterns to the contacts on each of the image sensor element electrodes in synchronism with the modulation frequency of the incident wavefield to transport photocharges laterally to the corresponding diffusions on which photocharges are accumulated [column 19, lines 10-17]; and

readout means [column 19, lines 25-30] for reading out the charges on the diffusions for use in calculating the modulation parameters of the incident modulated wavefield [column 20, lines 5-20 and 47-57].

Regarding claim 16, Schwarte shows the device as claimed in Claim 15. In addition, Schwarte shows in which photocharges are accumulated over a plurality of periods of the modulation frequency of the incident wavefield [column 14, lines 38-44 and 49-64].

Regarding claim 17, Schwarte shows the device as claimed in Claim 15. In addition, Schwarte shows in which each period of the modulation frequency is divided into a number of time intervals; wherein a separate contact and diffusion region is provided in each image sensor element for each time interval [column 14, lines 38-44 and 49-64].

Regarding claim 18, Schwarte shows the device as claimed in claim 15. In addition, Schwarte shows comprising an evaluation unit for calculating the modulation

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parameters of the incident wavefield from the charges readout from the diffusions [figure 13: element 15, column 17, lines 4-7].

Regarding claim 19, Schwarte shows the method of detecting and demodulating modulated wavefields comprising the steps of:

- a) illuminating the array of image sensing elements of claim 15 with the modulated wavefield [column 20, lines 6-8];
- b) dividing each period of the modulation frequency into a number of intervals [column 14, lines 38-44 and 49-64];
- c) providing a separate contact and corresponding diffusion region for each time interval [column 14, lines 38-44 and 49-64];
- d) transporting photoregenerated charge to the corresponding diffusion regions during each time interval and storing them therein [column 19, lines 12-23];
- e) reading out the stored charges from the diffusion regions [column 19, lines 12-23]; and
- f) calculating demodulation parameters from the charges readout from the diffusion regions [column 20, lines 5-20 and 47-57].

Regarding claim 20, Schwarte shows the method as claimed in Claim 19: in which charges are accumulated in the diffusion regions over more than one period of the modulation frequency [column 14, lines 38-44 and 49-64].

Regarding claim 21, Schwarte shows the method as claimed in Claim 19 in which the wavefield is directed onto the array by optical elements [column 20, lines 6-13 and column 15, lines 43-47].

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Regarding claim 22, Schwarte shows the method of determining the three dimensional shape of reflective object comprising the steps of:

- a) illuminating the object with a modulated light source [column 20, lines 6-13];
- b) imaging light reflected from the object onto an array of image sensor elements of a device as claimed in claim 15 to form a two dimensional intensity modulated wavefield whose local phase represents local distance from the object to the detection device [column 6, lines 20-22];
- c) dividing each period of the modulation frequency into a number of time intervals [column 14, lines 49-64];
- d) providing a separate contact and corresponding diffusion region for each time interval [column 14, lines 49-64];
- e) transporting photoregenerated charge to the corresponding diffusion regions during each time interval and storing them therein [column 19, lines 12-35];
- f) reading out the stored charge from the diffusion regions [column 19, lines 12-35];
- g) calculating the local phase of the modulated wavefield incident on the array;
and
- h) using the local phase information to determine the three dimensional shape of the object [column 15, lines 59-67 and column 16, lines 13-24].

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schwarte (WO98/10255).

Regarding Claim 8, Schwarte shows the image sensor element as claimed claim

1. Schwarte does not specify in which the insulating layer is between 1nm and 1um thick. However, it is well known in the art to provide oxide insulators of a thickness within 1nm and 1um, see last paragraph of page 513 of Microchip Fabrication (2000) by Peter Van Zant. It is known in the art that having an insulating layer is between 1nm and 1um is beneficial because they provide for faster devices and lower threshold voltages. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used an insulating layer of 1nm to 1um in the invention of Schwarte as it is known in the art, to provide for a faster device with a lower threshold voltage.

Regarding Claim 9, Schwarte shows an image sensor element as claimed in claim 1. Schwarte does not specify in which the electrode has a sheet resistivity of greater than 10 Ohms per square. However, as it is pointed out in the specification of the applicant, a material which is capable of providing such a sheet resistivity is doped polysilicon. It is well known in the art to provide electrodes made of doped polysilicon (electrode has a sheet resistivity of greater than 10 Ohms per square), see last paragraph of page 404 of Microchip Fabrication (2000) by Peter Van Zant. It is known in the art that having electrodes made of doped polysilicon (electrode has a sheet

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resistivity of greater than 10 Ohms per square) is beneficial because they provide for good ohmic contacts. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used an electrodes made of doped polysilicon (electrode has a sheet resistivity of greater than 10 Ohms per square) in the invention of Schwarte as it is known in the art, to provide for a good ohmic contact.

Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Schwarte (WO98/10255) in view of Meynants (US 7,268,815).

Regarding claim 13, Schwarte shows the image sensor element as claimed in claim 1. Schwarte does not show wherein the read out means is implemented as a transconductance amplifier, for measuring the photocurrent at the first or second diffusion regions, with a pixel select transistor. Meynants shows wherein the read out means is implemented as a transconductance amplifier, for measuring the photocurrent at the first or second diffusion regions, with a pixel select transistor [column 10, lines 41-50]. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used a wherein the read out means is implemented as a transconductance amplifier, for measuring the photocurrent at the first or second diffusion regions, with a pixel select transistor as suggested by Meynants in the invention of Schwarte for the purpose of providing a device which can perform the function of reading out the accumulated charge signals.

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Fax / Telephone Information


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eduardo A. Rodela whose telephone number is (571) 272-8797. The examiner can normally be reached on M-F, 9:00AM-5:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sue Purvis can be reached on (571) 272-1236. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Eduardo A Rodela
Examiner
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E.A.R.


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